



INDIANA
DEPARTMENT *of*
EDUCATION

2023 INDIANA ACADEMIC STANDARDS
MATHEMATICS

GRADE 4



Indiana Academic Standards Context and Purpose

Introduction

The Indiana Academic Standards for Grade 4 Mathematics are the result of a process designed to identify, evaluate, synthesize, and create high-quality, rigorous learning expectations for Indiana students.

Pursuant to Indiana Code (IC) 20-31-3-1(c-d), the Indiana Department of Education (IDOE) facilitated the prioritization of the Indiana Academic Standards. All standards are required to be taught. Standards identified as essential for mastery by the end of the grade level are indicated with shading and an “E.” The learning outcome statement for each domain immediately precedes each set of standards.

The Indiana Academic Standards are designed to ensure that all Indiana students, upon graduation, are prepared with essential knowledge and skills needed to access employment, enrollment, or enlistment leading to service.

What are the Indiana Academic Standards and how should they be used?

The Indiana Academic Standards are designed to help educators, parents, students, and community members understand the necessary content for each grade level, and within each content area domain, to access employment, enrollment, or enlistment leading to service. These standards should form the basis for strong core instruction for all students at each grade level and content area. The standards identify the minimum academic content or skills that Indiana students need in order to be prepared for success after graduation, but they are not an exhaustive list.

While the Indiana Academic Standards establish key expectations for knowledge and skills and should be used as the basis for curriculum, the standards by themselves do not constitute a curriculum. It is the responsibility of the local school corporation to select and formally adopt curricular tools, including textbooks and any other supplementary materials, that align with Indiana Academic Standards. Additionally, corporation and school leaders should consider the appropriate instructional sequence of the standards as well as the length of time needed to teach each standard. Every standard has a unique place in the continuum of learning, but each standard will not require the same amount of time and attention. A deep understanding of the vertical articulation of the standards will enable educators to make the best instructional decisions. These standards must also be complemented by robust, evidence-based instructional practices to support overall student development. By utilizing strategic and intentional instructional practices, other areas such as STEM and employability skills can be integrated with the content standards.

Content-Specific Considerations

The Indiana Academic Standards for Grade 4 Mathematics consist of five domains: Number Sense, Computation and Algebraic Thinking, Geometry, Measurement, and Data Analysis. The skills listed in each domain indicate what students should know and be able to do in Mathematics at each grade level. The Process Standards demonstrate the ways in which students should develop conceptual understanding of mathematical content, and the ways in which students should synthesize and apply mathematical skills.

Acknowledgments

The Indiana Department of Education appreciates the time, dedication, and expertise offered by Indiana's K-12 educators, higher education professors, representatives from business and industry, families, and other stakeholders who contributed to the development of the Indiana Academic Standards. We wish to specially acknowledge the committee members, as well as participants in the public comment period, who dedicated many hours to the review and evaluation of these standards designed to prepare Indiana students for success after graduation.

Mathematics Process Standards

PS.1: Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway, rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” and “Is my answer reasonable?” They understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

PS.2: Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

PS.3: Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They analyze situations by breaking them into cases and recognize and use counterexamples. They organize their mathematical thinking, justify their conclusions and communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. They justify whether a given statement is always true, sometimes, or never. Mathematically proficient students participate and collaborate in a mathematics community. They listen to or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

PS.4: Model with mathematics.

Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace using a variety of appropriate strategies. They create and use a variety of representations to solve problems and to organize and communicate mathematical ideas. Mathematically proficient students apply what they know and are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and formulas. They analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

PS.5: Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Mathematically proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. Mathematically proficient students identify relevant external mathematical resources, such as digital content, and use them to pose or solve problems. They use technological tools to explore and deepen their understanding of concepts and to support the development of learning mathematics. They use technology to contribute to concept development, simulation, representation, reasoning, communication, and problem solving.

PS.6: Attend to precision.

Mathematically proficient students communicate precisely to others. They use clear definitions, including correct mathematical language, in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They express solutions clearly and logically by using the appropriate mathematical terms and notation. They specify units of measure and label axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently and check the validity of their results in the context of the problem. They express numerical answers with a degree of precision appropriate for the problem context.

PS.7: Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. They step back for an overview and shift perspective. They recognize and use properties of operations and equality. They organize and classify geometric shapes based on their attributes. They see expressions, equations, and geometric figures as single objects or as being composed of several objects.

PS.8: Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated and look for general methods and shortcuts. They notice regularity in mathematical problems and their work to create a rule or formula. Mathematically proficient students maintain oversight of the process, while attending to the details as they solve a problem. They continually evaluate the reasonableness of their intermediate results.

Grade 4 Mathematics

Standards identified as essential for mastery by the end of the grade level are indicated with gray shading and an “E.” The learning outcome statement for each domain immediately precedes each set of standards.

Number Sense	
Learning Outcome: Students represent and round multi-digit numbers. Students model, compare, and generate equivalent fractions, mixed numbers, and decimal numbers to the tenths and hundredths.	
4.NS.1	Read and write whole numbers up to 1,000,000. Use words, models, standard form, and expanded form to represent and show equivalent forms of whole numbers up to 1,000,000.
4.NS.2	Model mixed numbers and improper fractions using visual fraction models such as number lines and area models. Use a visual fraction model to show the equivalency between whole numbers and whole numbers as fractions.
4.NS.3	Use fraction models to represent two equivalent fractions with attention to how the number and size of the parts differ even though the fractions themselves are the same size. Use this principle to generate equivalent fractions. [In grade 4, limit denominators of fractions to 2, 3, 4, 5, 6, 8, 10, 25, 100.] (E)
4.NS.4	Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators, or by comparing to a benchmark, such as 0, $\frac{1}{2}$, and 1). Explain why comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions (e.g., by using a visual fraction model). (E)
4.NS.5	Write tenths and hundredths in decimal and fraction notations. Use words, models, standard form, and expanded form to represent decimal numbers to hundredths. Mentally calculate fraction and decimal equivalents for halves and fourths (e.g., $\frac{1}{2} = 0.5 = 0.50$, $\frac{7}{4} = 1 \frac{3}{4} = 1.75$). (E)
4.NS.6	Compare two decimals to hundredths by reasoning about their size based on the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions (e.g., by using a visual model). (E)
4.NS.7	Use place value understanding to round multi-digit whole numbers to any given place value.
Computation and Algebraic Thinking	
Learning Outcome: Students solve real-world problems using place value strategies and properties of multiplication and division with limitations. Students compose (addition) and decompose (subtraction) non-unit fractions and mixed numbers using models and strategies, applying these concepts to real-world situations. Students investigate the relationship between two given sets of numbers and generate number patterns based upon given rules.	
4.CA.1	Multiply a whole number of up to four digits by a one-digit whole number and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Describe the strategy and explain the reasoning. (E)
4.CA.2	Find whole-number quotients and remainders with up to four-digit dividends and one-digit

	divisors using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Describe the strategy and explain the reasoning. (E)
4.CA.3	Show how the order in which two numbers are multiplied (commutative property) and how numbers are grouped in multiplication (associative property) will not change the product. Use these properties to show that numbers can be multiplied in any order. Investigate and apply the distributive property. (E)
4.CA.4	Investigate the mathematical relationship between factors and multiples for whole numbers from 1-100, including the set of factors and multiples for given numbers. Identify sets of factors and multiples for any given whole number up to 100.
4.CA.5	Solve real-world problems with whole numbers involving multiplicative comparison (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem), distinguishing multiplicative comparison from additive comparison. [In grade 4, division problems should not include a remainder.] (E)
4.CA.6	Add and subtract fractions with common denominators using visual fraction models. Decompose non-unit fractions to represent them as iterations of unit fractions. (E)
4.CA.7	Add and subtract mixed numbers with common denominators (e.g., by replacing each mixed number with an equivalent fraction and/or by using properties of operations and the relationship between addition and subtraction).
4.CA.8	Solve real-world problems involving addition and subtraction of fractions referring to the same whole and having common denominators (e.g., by using visual fraction models and equations to represent the problem). (E)
4.CA.9	Describe the relationship between two terms and use it to find a second number when a first number is given. Generate a number pattern that follows a given rule.
Geometry	
Learning Outcome: Students utilize appropriate tools to identify, describe, and draw parallelograms, rhombuses, and trapezoids in addition to classifying two-dimensional shapes.	
4.G.1	Identify, describe, and draw parallelograms, rhombuses, and trapezoids using appropriate tools (e.g., ruler, straightedge, and technology).
4.G.2	Identify, describe, and draw rays, angles (right, acute, obtuse), and perpendicular and parallel lines using appropriate tools (e.g., ruler, straightedge, and technology). Identify these in two-dimensional figures.
4.G.3	Classify triangles and quadrilaterals based on the presence or absence of parallel or perpendicular lines, or right, acute, or obtuse angles.
Measurement	
Learning Outcome: Students solve real-world problems involving distance, intervals of time, volumes, masses of objects, and money by applying computation strategies, precise measurement skills, and relationships between systems of measurement. Students continue to apply the concept of area and perimeter to complex shapes to identify solutions.	
4.M.1	Measure length to the nearest quarter-inch, eighth-inch, and millimeter. (E)

4.M.2	Within given measurement systems, convert larger units to smaller units, including km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec., and use these conversions to solve real-world problems. (E)
4.M.3	Use the four operations to solve real-world problems involving distances, intervals of time, volumes, masses of objects, and money. Include addition and subtraction problems involving simple fractions and problems that require expressing measurements given in a larger unit in terms of a smaller unit. (E)
4.M.4	Apply the area and perimeter formulas for rectangles to solve real-world and other mathematical problems. Investigate the area of complex shapes composed of rectangles by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts; apply this technique to solve real-world problems and other mathematical problems. (E)
Data Analysis	
Learning Outcome: Students collect and ask questions of the data.	
4.DA.1	Formulate questions that can be addressed with data. Collect, organize, and graph data from observations, surveys, and experiments using line plots with whole number intervals, single- and scaled bar graphs, and frequency tables. Solve real-world problems by analyzing and interpreting the data using grade-level computation and comparison strategies. (E)
4.DA.2	Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using data displayed in line plots.